

FURTHER NOTES ON THE EGGS OF BUTTERFLIES.

A Supplement to C. F. M. SWYNNERTON'S Memoir XIV (p. 317), *Experiments on some Carnivorous Insects*, etc.

I HAVE made a point of making coloured drawings of any butterfly eggs that I have been able to obtain, *as seen against their usual natural background*; for it is only in this way that their relative conspicuousness can be assessed. I had hoped to incorporate these drawings in a plate to be published with this paper; but, although this has proved to be impossible, it is worth repeating that the conspicuousness of many of these eggs relatively to the point of vision of the closely-searching bird is very great indeed. The contrast of the ivory-like eggs of *Danaida chrysippus* with the commonly quite dark green leaves of the species of *Asclepias* on which it feeds, and that of other Danaine and Acraeine eggs—bright yellow or whitish and before hatching purplish brown—with the leaves of *their* food-plants is quite marked. This conspicuousness is furthermore often much enhanced by the eggs being laid many together. To watch an *Amauris*—slowly, deliberately and with carelessness of attack—laying her eggs one after another on a highly-exposed leaf of *Cynanchum*, the eggs themselves more or less closely spaced and visible to the observer ten feet away, must convince any one who knows the hurried laying of some other butterflies of the existence of special protection.

Eggs of certain species are, of course, laid sometimes on the upper surface, sometimes on the lower, of a leaf, sometimes on the petiole or a twig; and the degree of conspicuousness varies accordingly. An egg laid under a leaf should commonly be fairly visible to searching birds which make a point of minutely examining the undersides of leaves; but its appearance there, in relative obscurity and seen against the light, is naturally somewhat different from what it would be under other circumstances. Yet it is often conspicuous enough as a darker object than the rest of the leaf, for the under surface generally receives

enough reflected light from the sunlit ground or other leaves below to make the egg's detail easily visible.

The eggs of *Pyrameis cardui* (blue-green), *Antanartia schoeneia* (grey-green) and *Eurytela hiarbas* (glassy, slightly yellowish green) are all less contrasted with the leaves of their respective food-plants than are the eggs of the *Danainae* and *Acraeinae*. They do not at once catch the eye as these latter are apt to do, and, by the careless searcher or when not looked at directly, may often be passed over. Yet, searched for well, even these are very fairly visible, and I have noticed that the eggs of *Antanartia* are somewhat particularly so when laid beneath a leaf. In hairiness (shared with *Byblia*) the *Eurytela* egg resembles that of its food-plant at Chirinda. This certainly aids in such concealment as it enjoys, yet, when the egg is detected, this same hairiness gives it great distinctiveness.

A very beautiful egg, if a small one, is the clear cut-glass egg, just tinged with green, of *Hypolimnas misippus*, in fair contrast to the leaf of *Portulaca*. A curious egg is that of *Pseudacraea lucretia*, a half-sphere with a bubbled or honeycombed appearance due to the occupation of the whole exposed surface by closely packed depressions. It is perhaps less in contrast with the peculiar russet or silvery underside of the leaves of its food-plants (*Chrysophyllum* spp.) than a considerable proportion of butterfly eggs are with the coloration of theirs. The green egg of *Charaxes ethalion*, which, with the *Pseudacraea* egg, seemed to be the most readily taken by the ants, matches the green of its food-plant (*Albizzia*) better than any egg I know, especially just at first. Later it develops its ring, a dark brown one, and it then looks not very unlike the extra-floral nectaries of *Albizzia chirindensis*. I have not examined those of typical *Albizzia fastigiata*, its food-plant in Natal: In any case the resemblance, such as it is, is unlikely to have been the result of selection, as the ring is a common feature of *Charaxes* eggs, and even enemies that are easily deceived or are looking carelessly would learn to distinguish the egg from the nectary by its different position on the leaf. I have seen one or two broods of *C. ethalion* (out of a large number) in which the eggs were yellow instead of green.

The strong ringing of the egg of *Papilio dardanus* is perhaps a little more notable, though a tendency in that direction occurs in other Papilionine eggs at Chirinda.

Like these, it starts as a light yellowish-green egg, conspicuous through being so much paler than the various Rutaceous leaves on which it is laid—*Teclea*, *Toddalia*, *Vepris*, *Clausena* and *Citrus* of all species. It shortly changes into a dull whitish egg with an irregular purplish or brown-madder ring round its greatest circumference and a dark spot in the centre. There is now a superficial resemblance to the egg of *Charaxes brutus*, though the ring of the latter eventually attains a deeper colour and the shape of the egg is a little different, that of the *Charaxes* having the usual depressed and slightly sculptured top characteristic of the eggs of that genus. An ordinary hand-lens makes the difference clear, and it is probable that such a lens gives us much the appearance seen by the small, closely-peering warbler or white-eye. In *P. dardanus*, as in *C. ethalion*, I have seen a single brood (out of many) in which the eggs, after developing their ring, were yellow, and looked very like those of *Charaxes candiope*. In two broods the eggs were unusually small—more like those of *P. demodocus*.

The resemblance of the eggs of *Atella phalantha* to those of one or two of our commoner *Acraeas* is even stronger, though the common appearance is again brought about by a common colour and general shape with a somewhat different sculpturing. Apart from the fact that *Atella* is not so very far removed from the *Acraeinae*, we need to know whether all *Atella* eggs are like those of *A. phalantha*. It is early days to suggest mimicry when we do not yet know whether the egg-enemies that recognise by sight discriminate as did the drivers. Nevertheless, the latter's refusals show that a *potential* basis for preference certainly exists, so that the possibility of mimicry is at any rate worth bearing in mind; and the results from the drivers, if they should be more generally applicable, suggest that if there should happen to be mimicry in any of the above resemblances, mnemonic considerations may have contributed to it in even greater degree than differences in grade. I have already suggested, elsewhere (Proc. Ent. Soc. 1915, p. xlii), that such considerations—the principle of increased reminding-power and facilitated recognition—and not Müller's principle of the shared loss, are the real basis of numerical mimicry.